National Aeronautics and Space Administration

NASA's Space Launch System:
A Capability for Deep Space Exploration

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Space Launch System (SLS) Program
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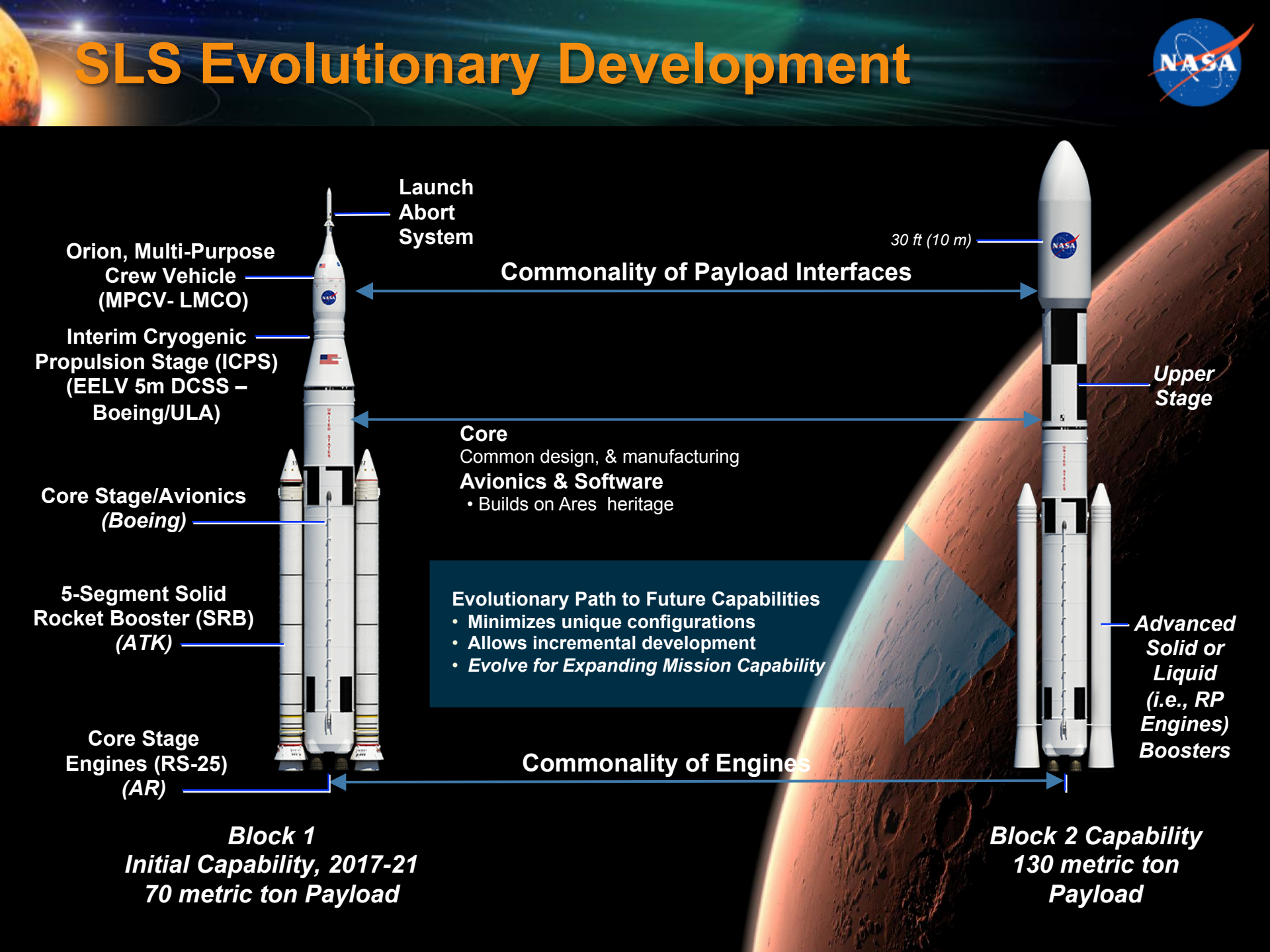
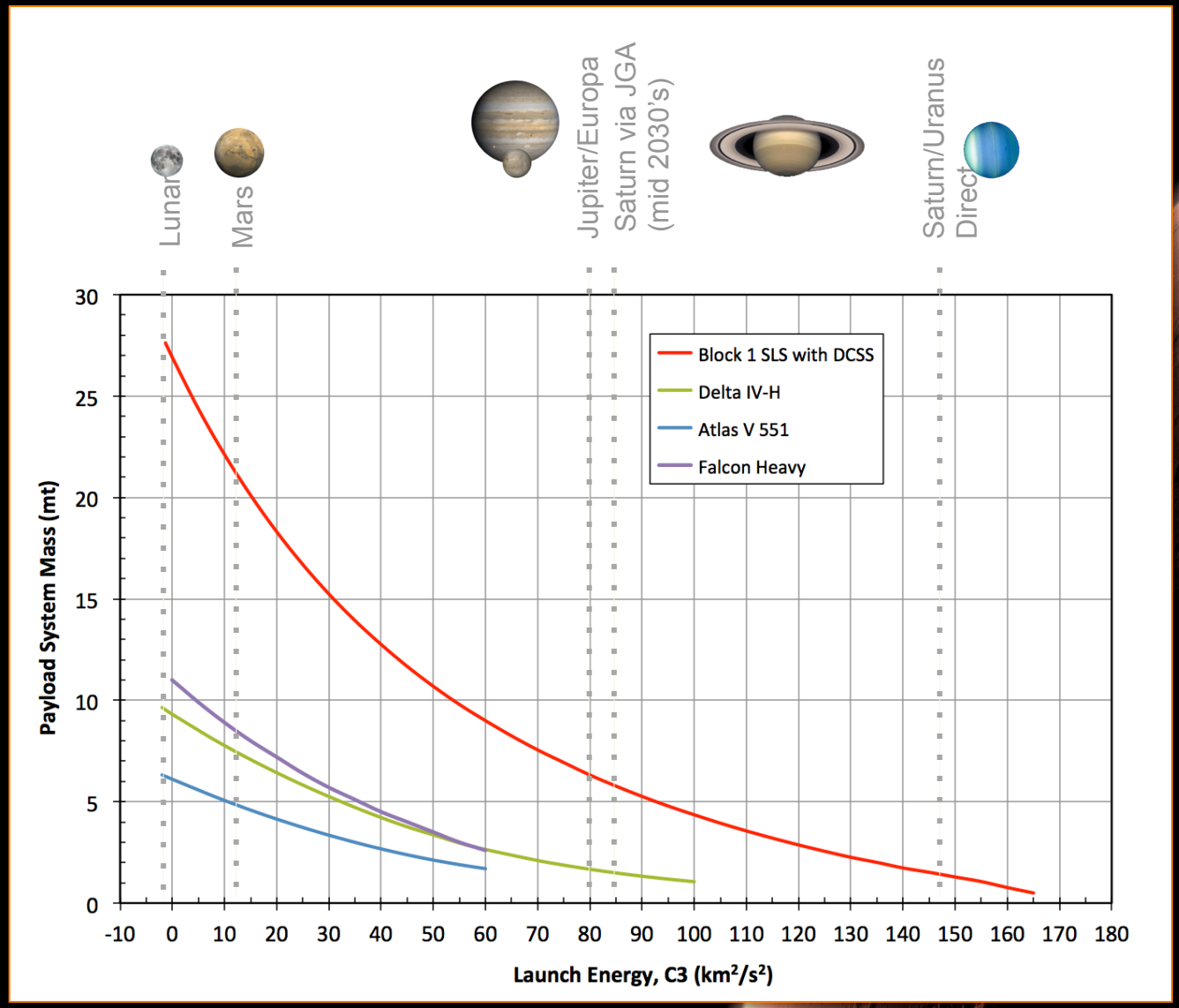
Space Launch System

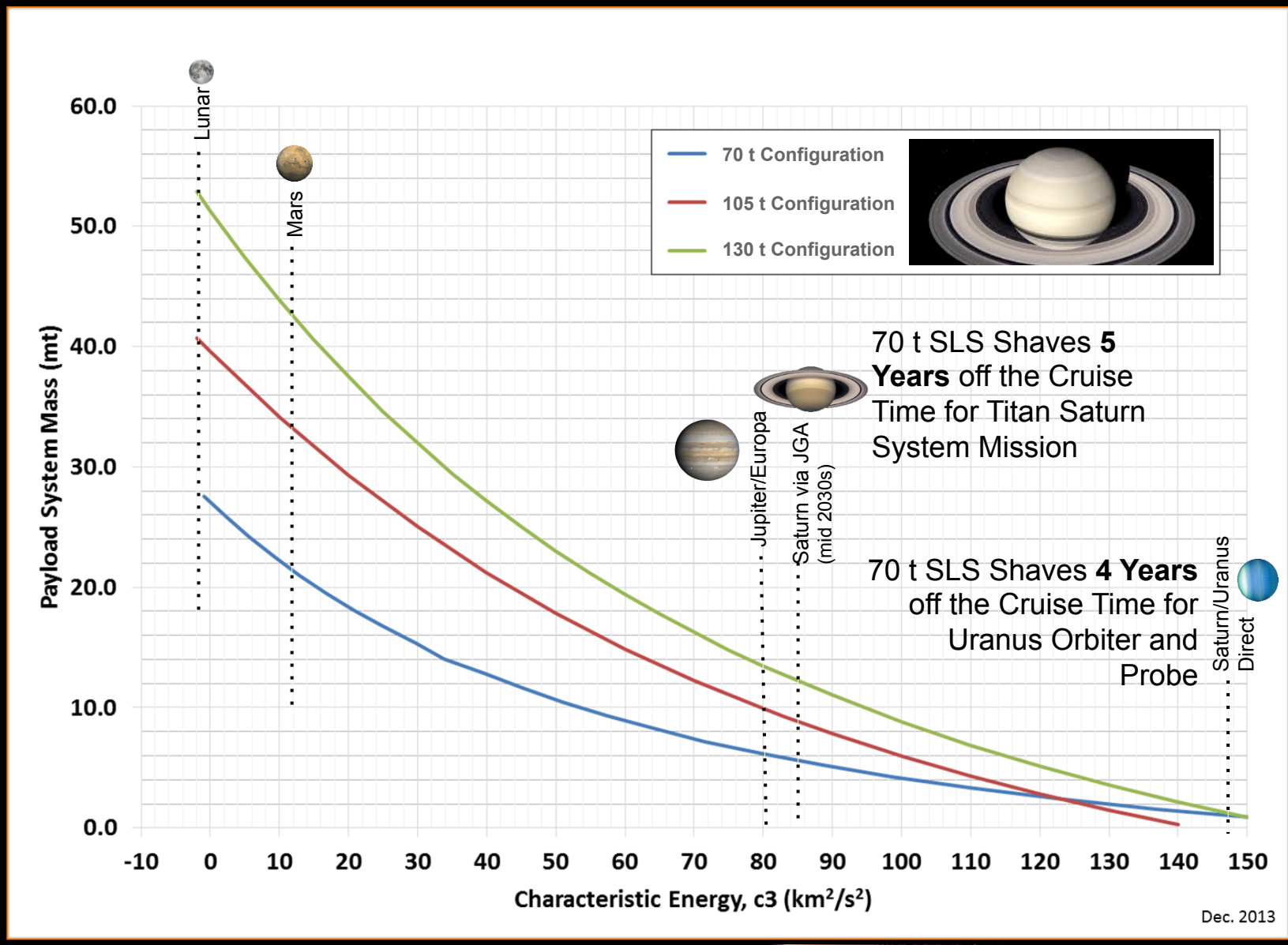
SLS Evolutionary Development



SLS Initial Configuration Performance



SLS Evolved Performance



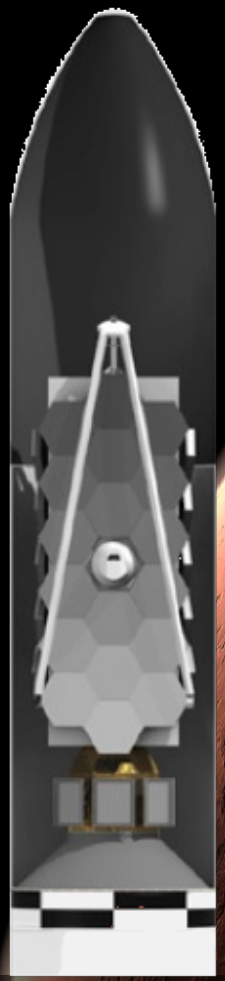
SLS Offers Unrivaled Payload Volume

- SLS is investigating utilizing existing fairings for early cargo flights, offering payload envelope compatibility with design for current EELVs
- Phase A studies in work for 8.4m and 10 m fairing options

4m x 12m
(100 m^3)

5m x 14m
(200 m^3)

5m x 19m
(300 m^3)



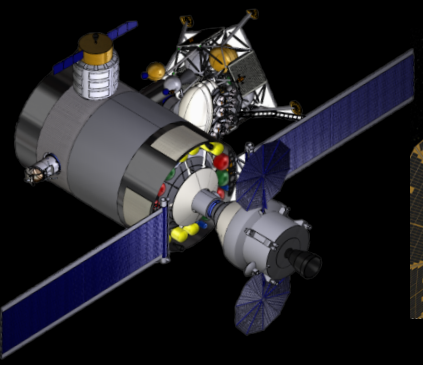
8.4m x 31m
(1200 m^3)

10m x 31m
(1800 m^3)

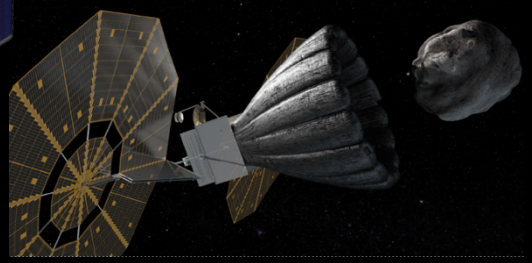
SLS Mission Benefits

- **SLS Being Developed to Enable Exploration**
  - **Volume and mass capability/margin required for complex deep-space human mission**
    - Increased design simplicity
    - Fewer origami-type payload designs needed to fit in the fairing
    - Simplifies on-orbit operations
    - Reduced risks and hazards
- **SLS investment can be leveraged for other missions requiring large volume or mass, or reduced trip times**
    - Deep Space Exploration
    - Planetary Landers
    - Human Habitats
    - Great Observatories
    - Space Solar Power
    - Outer Planet Missions
    - National Security Space Payloads

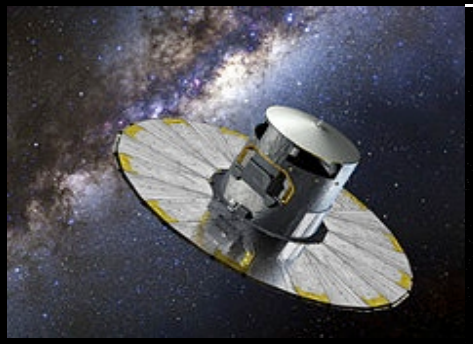
SLS Mission Capabilities



Space Habitat

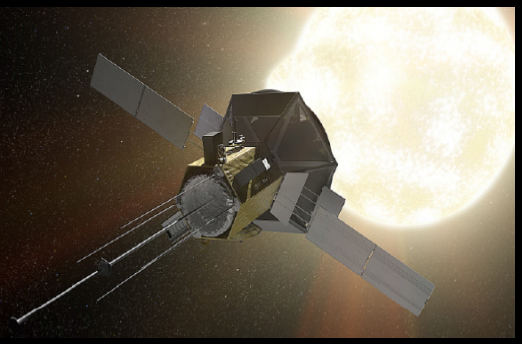


Asteroid Rendezvous



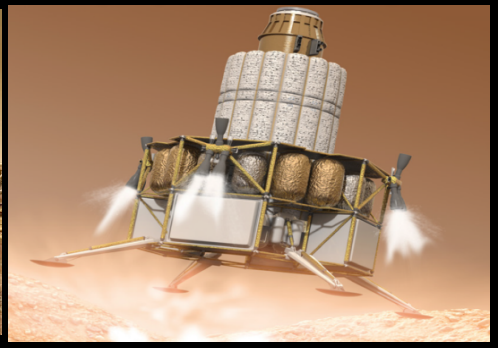
Deep Space Telescope

GEO Servicing

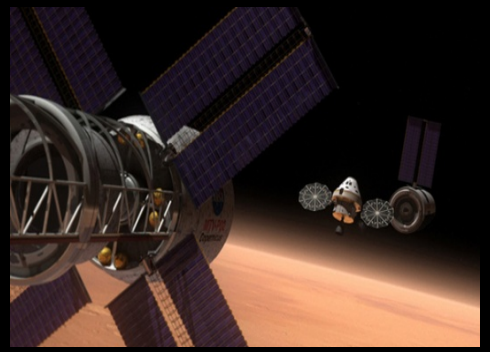


Solar Probe

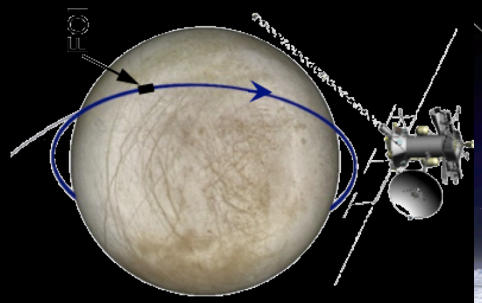
Mars Sample Return



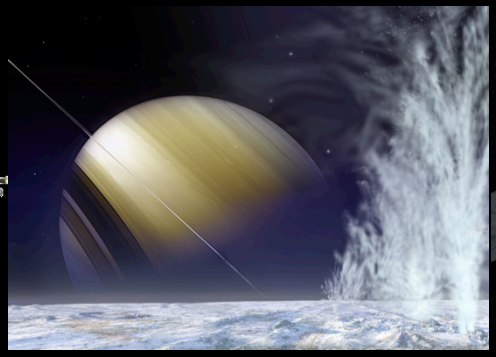
Mars Cargo Lander



Humans to Mars

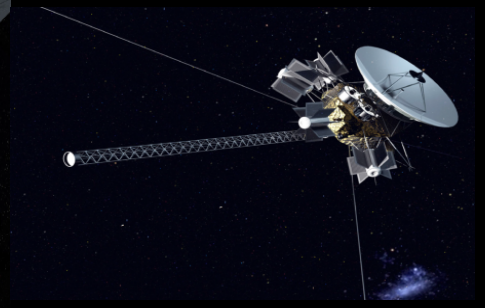


Europa Clipper



Enceladus Return

Uranus Spacecraft



Interstellar

Recent Progress

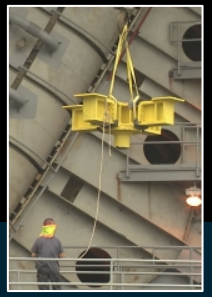
Launch Vehicle Stage Adapter: Contract awarded in February 2014.

MPCV-to-Stage Adapter: First flight hardware delivered to ULA for Exploration Flight Test-1 in Fall 2014.

Avionics: Flight software tested at Armstrong using F-18 in November 2013; avionics "first light" marked in January 2014.

Core Stage: Initial confidence barrels and domes completed; MAF tooling installation to be completed in April 2014.

Boosters: Thrust Vector Control test conducted in October 2013; preparations underway for QM-1.



Engines: Thrust frame adapter fitted to A-1 stand at Stennis Space Center; RS-25 testing begins July 2014.

Summary

- **SLS provides capability for human exploration missions.**
  - 70 t configuration enables EM-1 and EM-2 flight tests.
  - Evolved configurations enable missions including humans to Mars.
- **SLS offers unrivaled benefits for a variety of missions.**
  - 70 t provides greater mass lift than any contemporary launch vehicle; 130 t offers greater lift than any launch vehicle ever.
  - With 8.4m and 10m fairings, SLS will over greater volume lift capability than any other vehicle.
  - Initial ICPS configuration and future evolution will offer high C3 for beyond-Earth missions.
- **SLS is currently on schedule for first launch in December 2017.**
  - Preliminary design completed in July 2013; SLS is now in implementation.
  - Manufacture and testing are currently underway.
  - Hardware now exists representing all SLS elements.